

10 REDUCED
INEQUALITIES



SCWS 2017

Connecting the World
for a Sustainable Future

REDUCED INEQUALITIES

**Barriers that inhibit learning:
Can Science Centres help?**

Dr Derek Fish

Unizulu Science Centre

South Africa



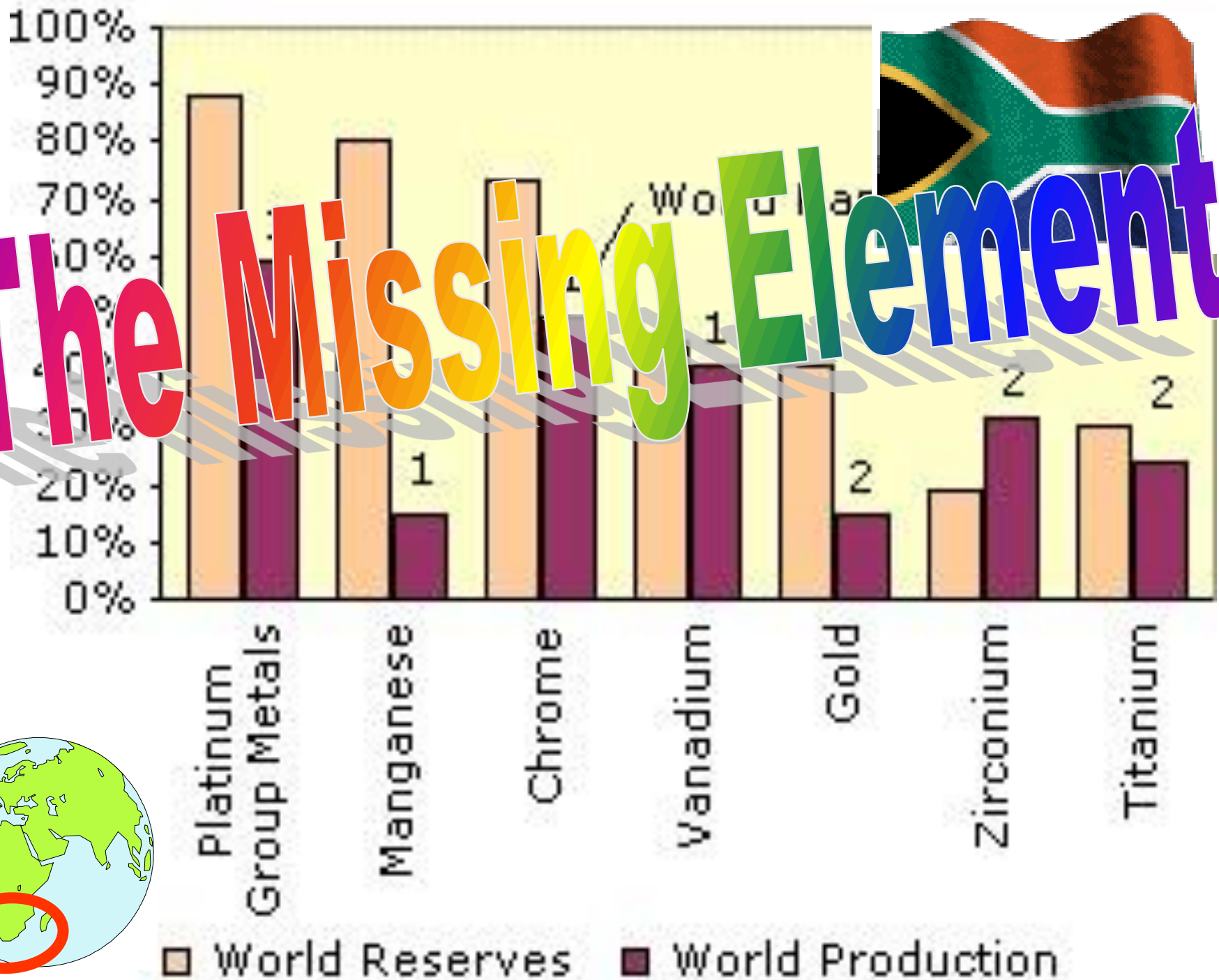
UNIVERSITY OF
ZULULAND

UNIZULU
SCIENCE CENTRE

4 QUALITY
EDUCATION



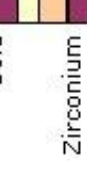
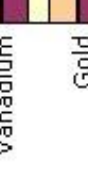
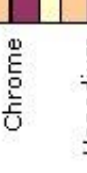
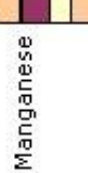
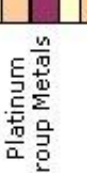
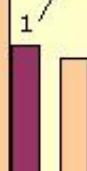
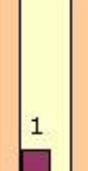
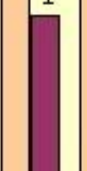
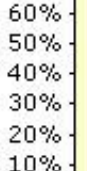
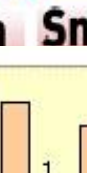
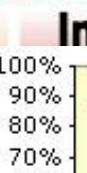
The Missing Element



PERIODIC TABLE of the ELEMENTS



DEPARTMENT OF
SCIENCE AND TECHNOLOGY

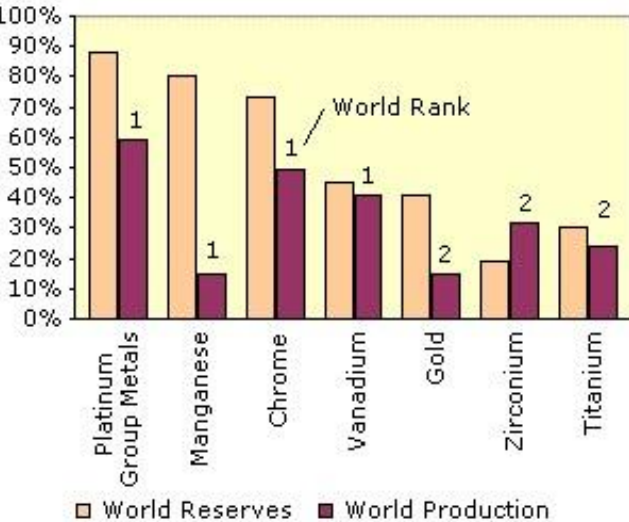
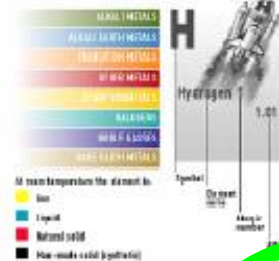


DMITRI MENDELEYEV (1834 - 1907)

The Russian chemist, Dmitri Mendeleev, was the first to show us that if elements were listed in order of atomic mass, they showed regular, predictable repeating properties. He first stated his discovery in a periodic table of elements, now regarded as the backbone of modern chemistry.

The surprising achievement of Mendeleev's periodic table lay in his grouping of then, unknown elements. In 1869, the year he published his periodic classification, the element's atomic mass and chemical properties were unknown. Mendeleev left spaces for these in his table, predicted their atomic masses and other chemical properties. In years later, gallium, discovered and his predictions were found to be accurate. Other discoveries followed. His chemical behavior method that predicted by Mendeleev.

This remarkable man, the youngest in a family of 17 children, has left the scientific community with a classification system so powerful that it became the cornerstone of modern chemistry. The periodic table of elements was first published in 1869, and it was named after him. In 1950, element 101 was named after him. Mendelevium.



The TIMSS & PIRLS International Study Center is dedicated to improving student achievement. It serves as the International Study Center

TIMSS



Trends in International Mathematics and Science Study



2007

2003

1999

1995

Advanced 2008

Eighth Grade*

Country Average Achievement

Singapore	643
Korea	607
Japan	605
Hong Kong	588
Belgium (Fl)	585
Czech Republic	584
Slovak Republic	547
Switzerland	545
Netherlands	541
Slovenia	541
Bulgaria	540
Austria	539
France	538
Hungary	537
Russian Federation	535
Australia	530
Ireland	527
Canada	527
Belgium (Fr)	526
Thailand	522
Israel	522
Sweden	519
Germany	509
New Zealand	508
England	506
Norway	503
Denmark	502
United States	500
Scotland	498
Latvia (LSS)	493
Spain	487
Iceland	487
Greece	484
Romania	482
Lithuania	477
Cyprus	474
Portugal	454
Iran, Islamic Rep.	428
Kuwait	392
Colombia	385
South Africa	354

Seventh Grade*

Country Average Achievement

Singapore	601
Korea	577
Japan	571
Hong Kong	564
Belgium (Fl)	558
Czech Republic	523
Netherlands	516
Bulgaria	514
Austria	509
Slovak Republic	508
Belgium (Fr)	507
Switzerland	506
Hungary	502
Russian Federation	501
Ireland	500
Slovenia	498
Australia	498
Thailand	495
Canada	494
France	492
Germany	484
Sweden	477
England	476
United States	476
New Zealand	472
Denmark	465
Scotland	463
Latvia (LSS)	462
Norway	461
Iceland	459
Romania	454
Spain	448
Cyprus	446
Greece	440
Lithuania	428
Portugal	423
Iran, Islamic Rep.	401
Colombia	389
South Africa	348

Eighth Grade*

Country Average Achievement

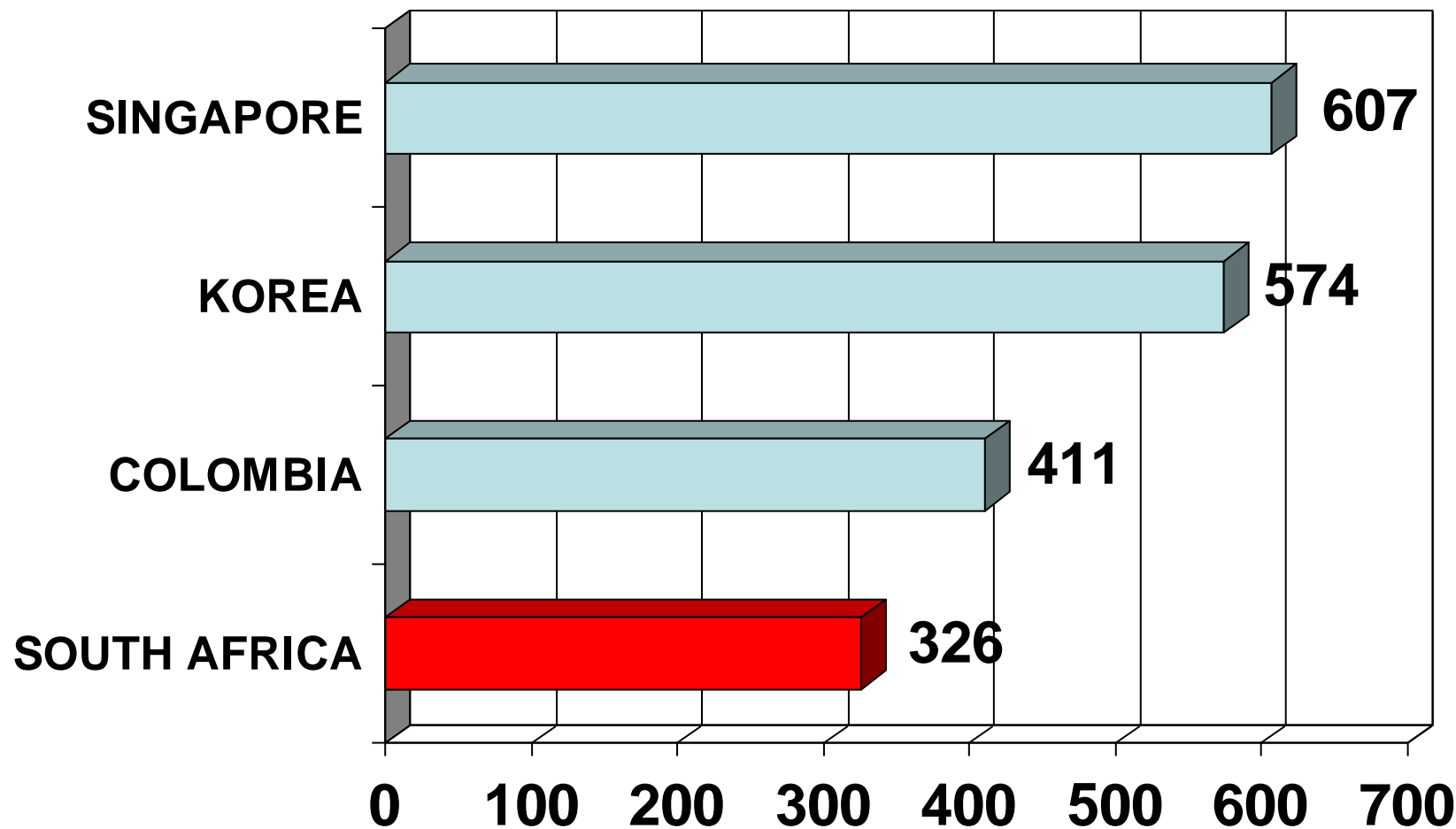
Singapore	607
Czech Republic	574
Japan	571
Korea	565
Bulgaria	565
Netherlands	560
Slovenia	560
Austria	558
Hungary	554
England	552
Belgium (Fl)	550
Australia	545
Slovak Republic	544
Russian Federation	538
Ireland	538
Sweden	535
United States	534
Germany	531
Canada	531
Norway	527
New Zealand	525
Thailand	525
Israel	524
Hong Kong	522
Switzerland	522
Scotland	517
Spain	517
France	498
Greece	497
Iceland	494
Romania	486
Latvia (LSS)	485
Portugal	480
Denmark	478
Lithuania	476
Belgium (Fr)	471
Iran, Islamic Rep.	470
Cyprus	463
Kuwait	430
Colombia	411
South Africa	326

Seventh Grade*

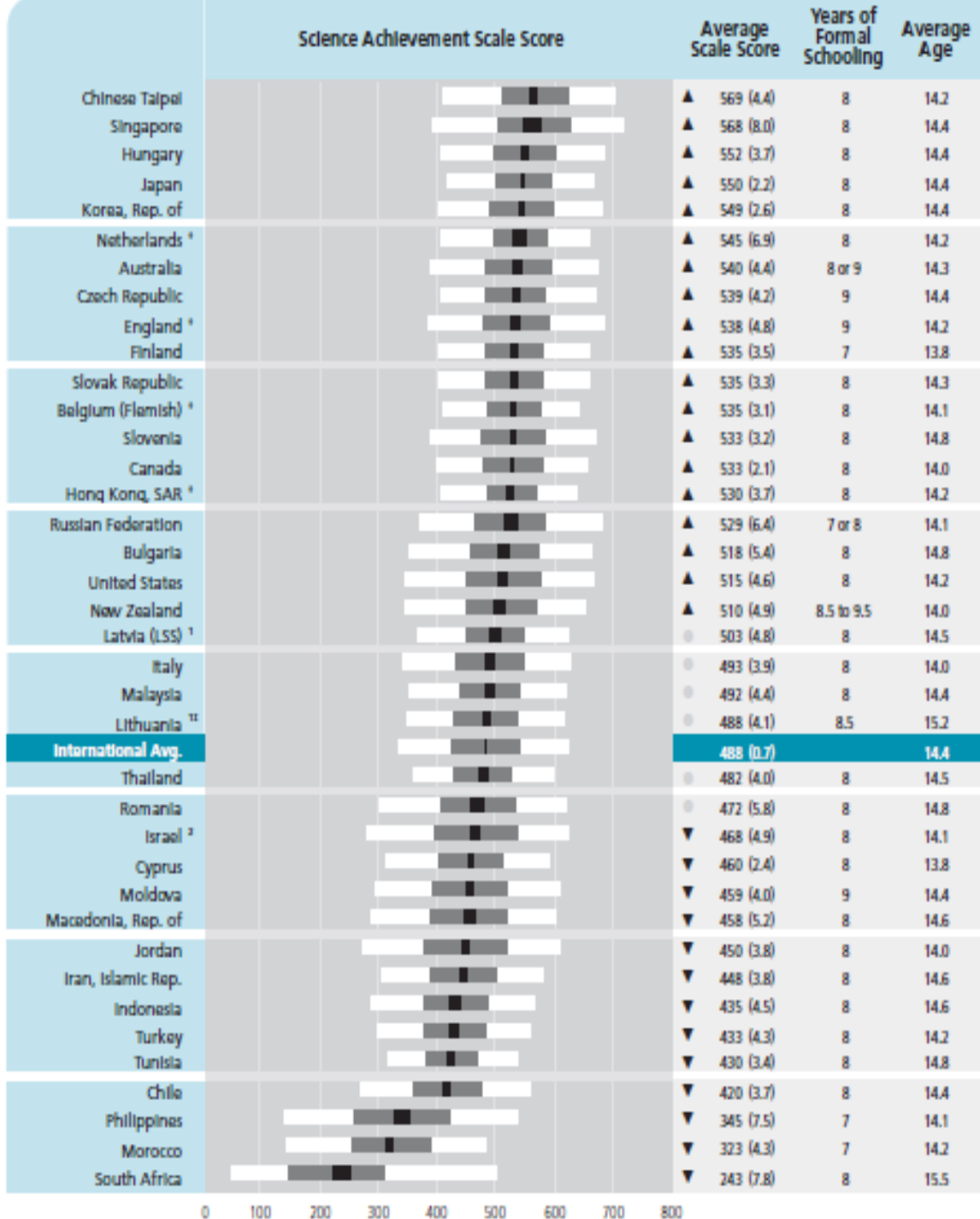
Country Average Achievement

Singapore	545
Korea	535
Czech Republic	533
Japan	531
Bulgaria	531
Slovenia	530
Belgium (Fl)	529
Austria	519
Hungary	518
Netherlands	517
England	512
Slovak Republic	510
United States	508
Australia	504
Germany	499
Canada	499
Hong Kong	495
Ireland	495
Thailand	493
Sweden	488
Russian Federation	484
Switzerland	484
Norway	483
New Zealand	481
Spain	477
Scotland	468
Iceland	462
Romania	452
France	451
Greece	449
Belgium (Fr)	442
Denmark	439
Iran, Islamic Rep.	436
Latvia (LSS)	435
Portugal	428
Cyprus	420
Lithuania	403
Colombia	387
South Africa	317

TIMMS 1995: Top 2 and Bottom 2 Countries

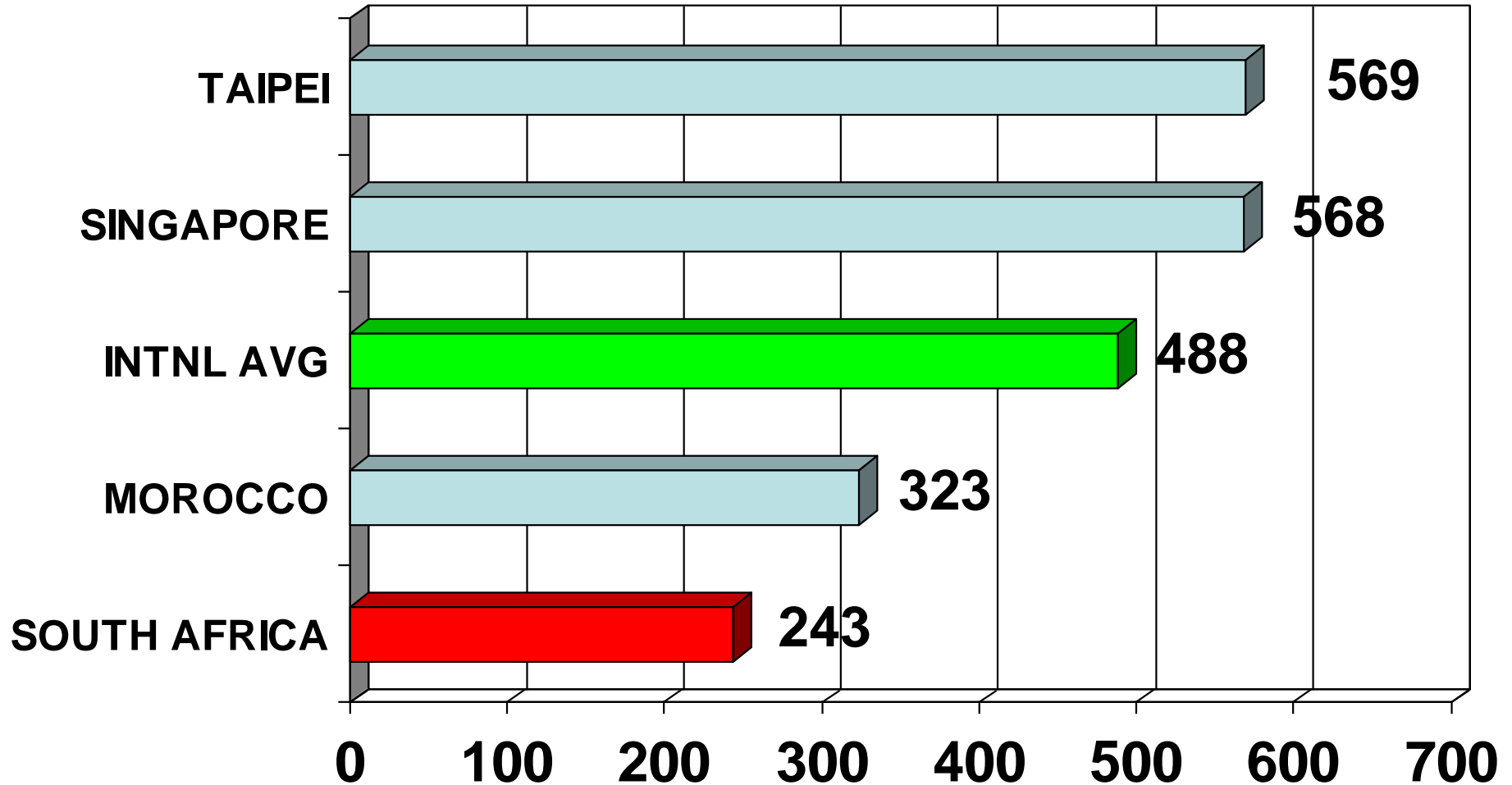


TIMSS 1999

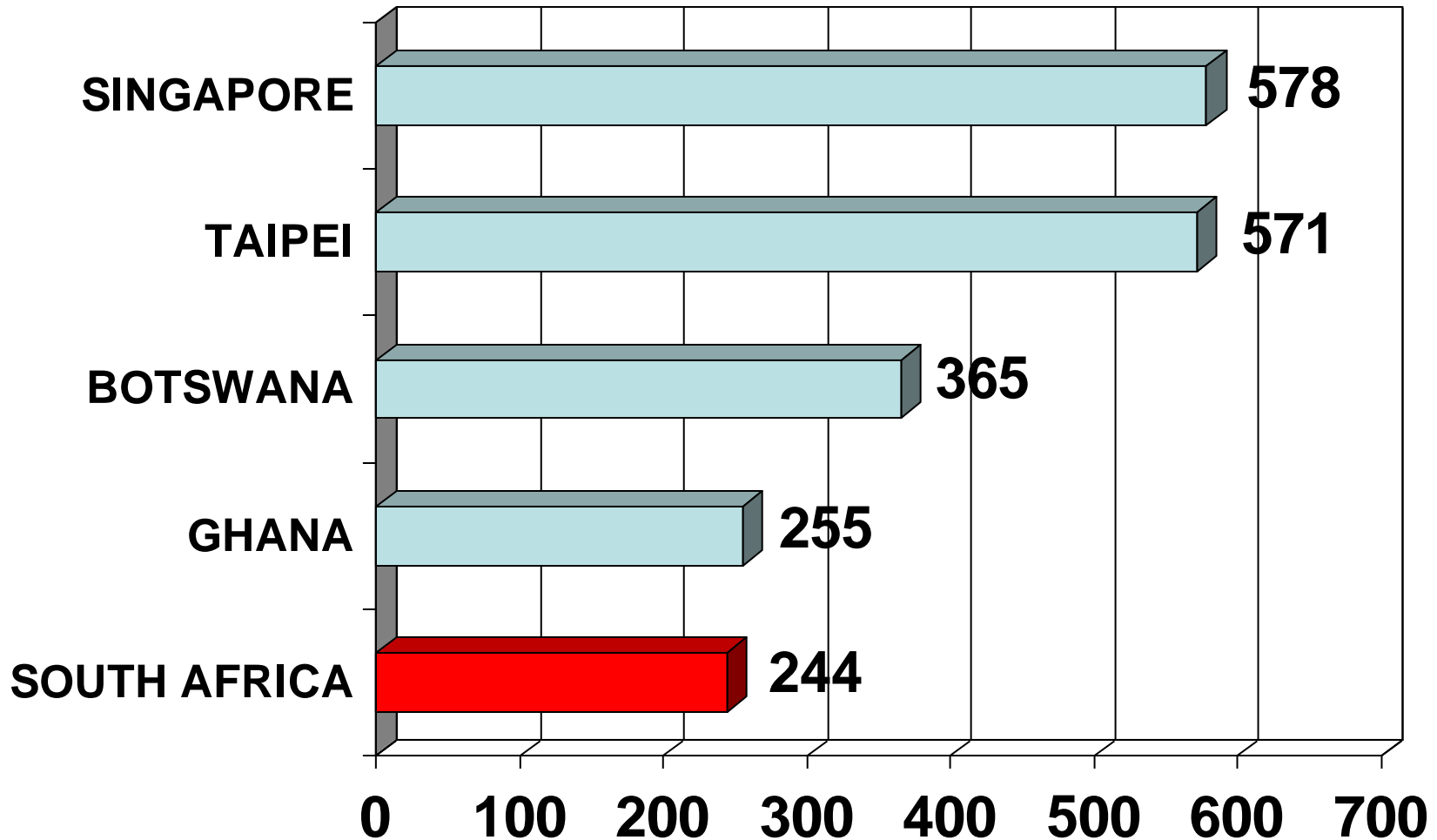


SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1998-1999.

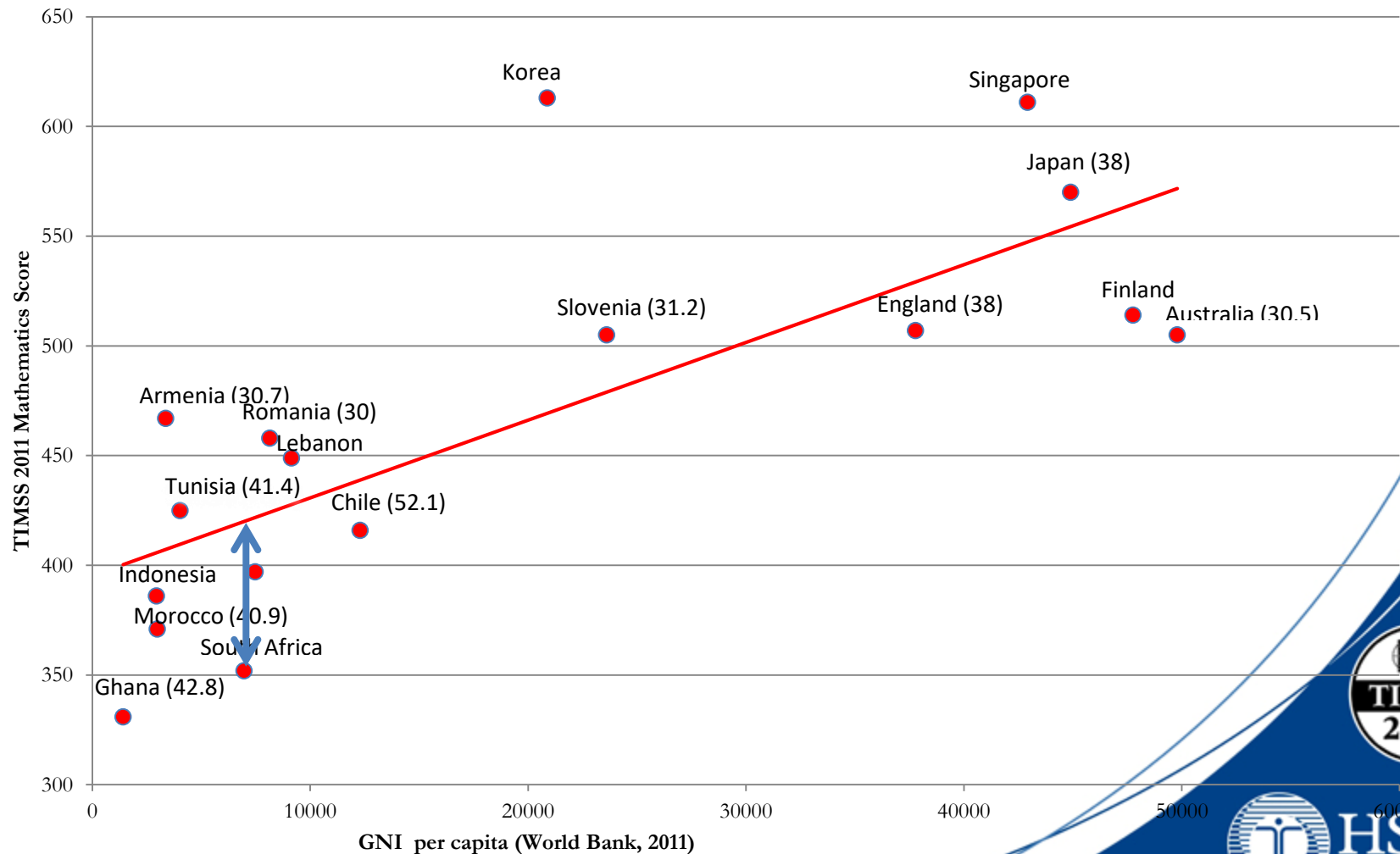
TIMMS 1999: Top 2 and Bottom 2 Countries



TIMMS 2003: Top 2 and Bottom 3 Countries



Achievement in TIMSS vs GNI

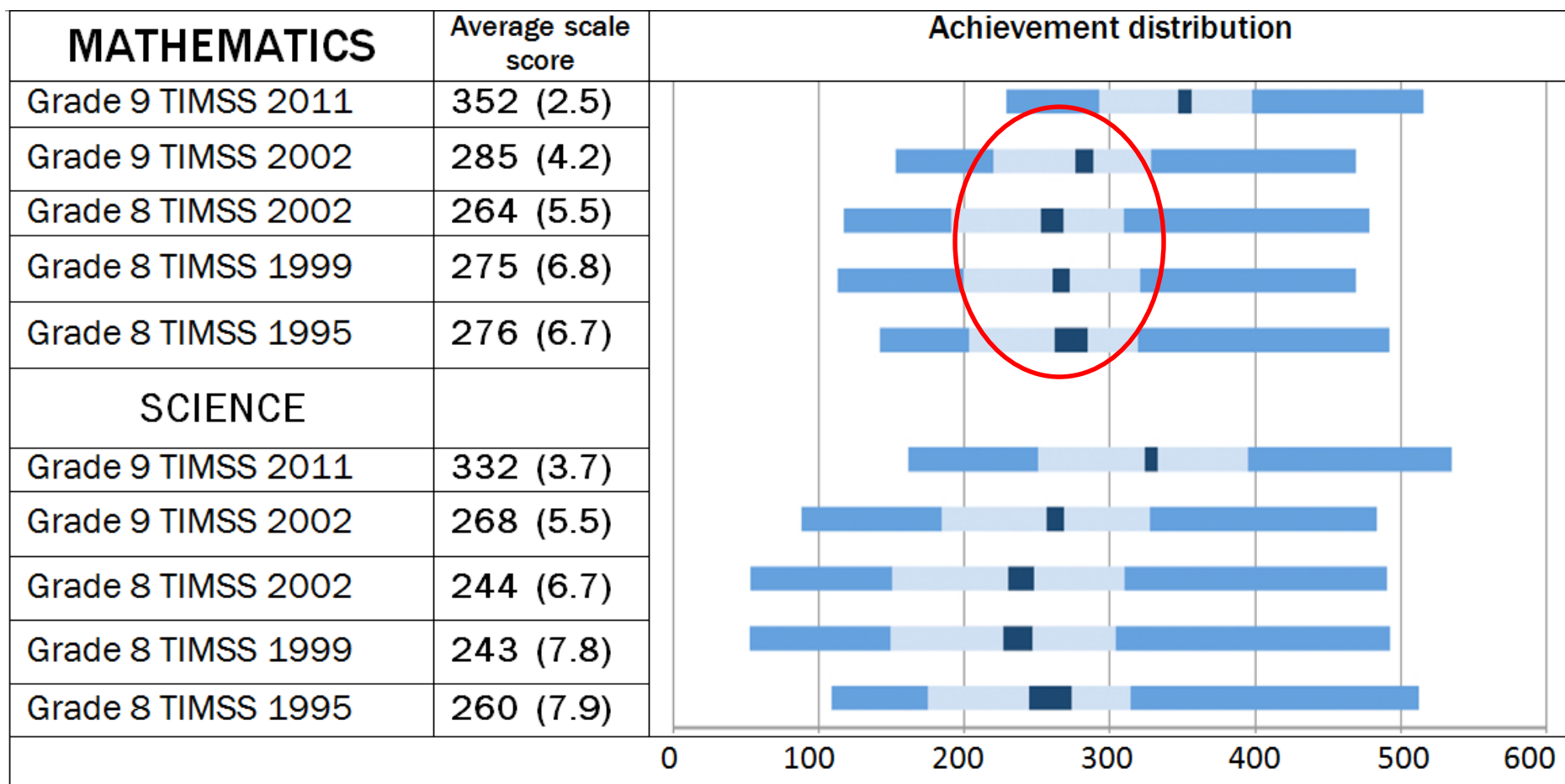


TIMSS

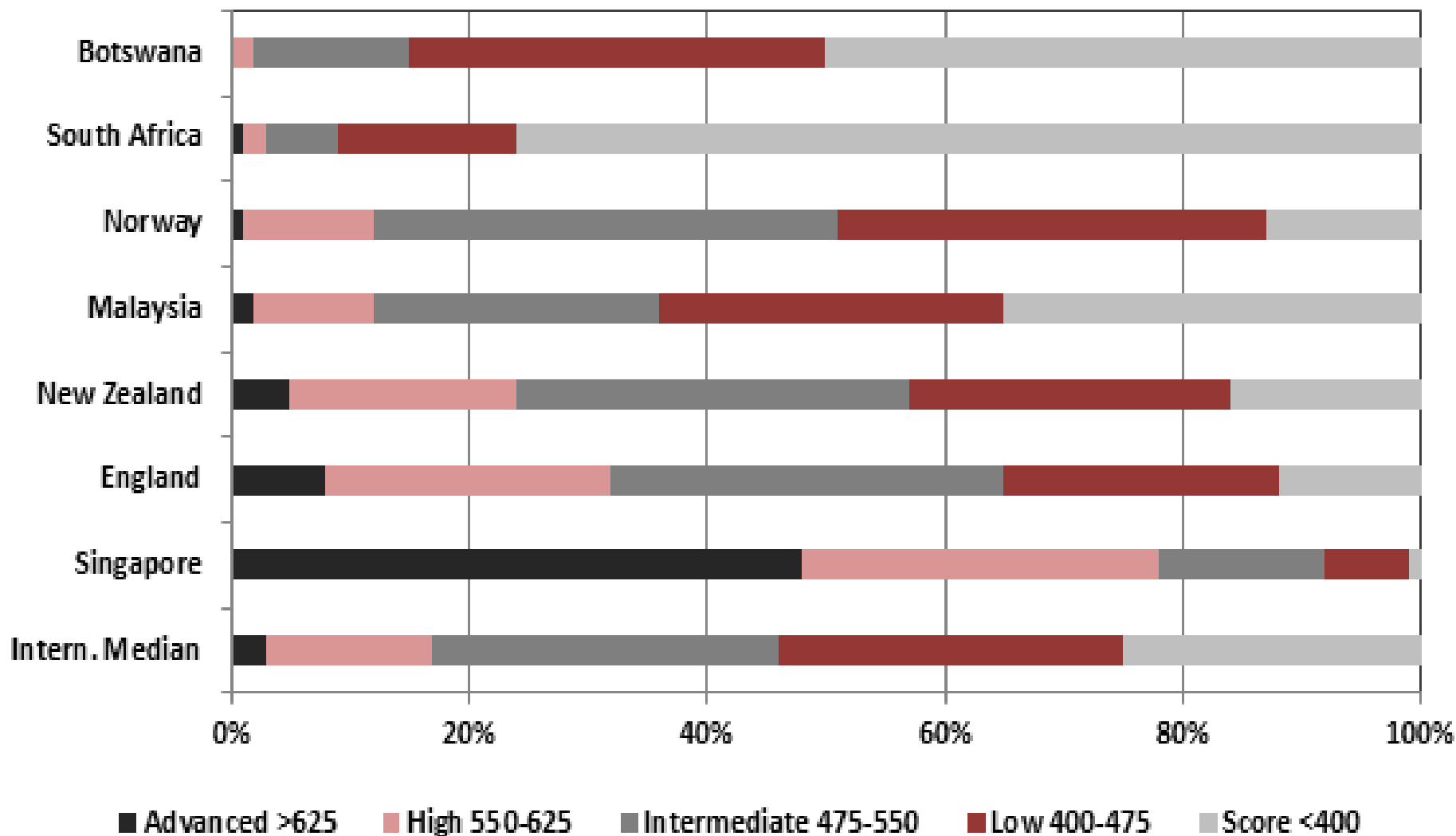
2007

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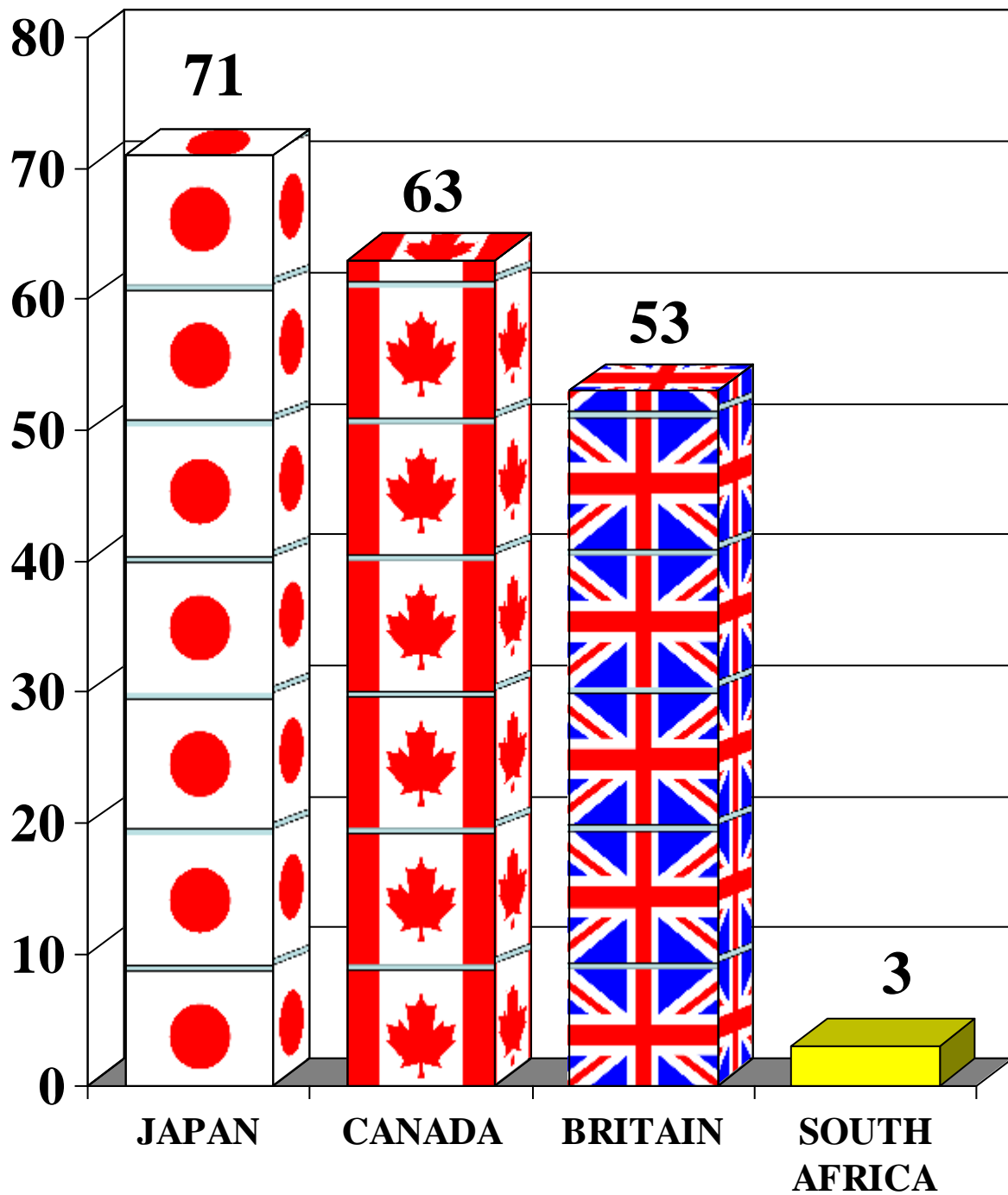

Alberta (Canada)	Egypt	Lebanon	Quebec (Canada)
Algeria	El Salvador	Lithuania	Romania
Armenia	England	Malaysia	Russian Federation
Australia	Georgia	Malta	Saudi Arabia
Austria	Germany	Massachusetts (United States)	Scotland
Bahrain	Ghana	Minnesota (United States)	Serbia
Basque (Spain)	Hong Kong	Moldova	Singapore
Bosnia and Herzegovina	Hungary	Mongolia	Slovak Republic
Botswana	Indonesia	Morocco	Slovenia
British Columbia (Canada)	Iran	Netherlands	Sweden
Bulgaria	Israel	New Zealand	Syrian Arab Republic
Chinese Taipei	Italy	Norway	Thailand
Colombia	Japan	Oman	Tunisia
Cyprus	Jordan	Ontario (Canada)	Turkey
Czech Republic	Kazakhstan	Palestinian National Authority	Ukraine
Denmark	Korea, Republic of	Qatar	United States
Dubai (United Arab Emirates)	Kuwait		Yemen
	Latvia		



High quality school graduates: a comparison



SCIENTISTS AND TECHNOLOGISTS PER 1000 PEOPLE





What ***“DRIVES”*** *the* *Global* *Economy??*

Occupied the minds of not just “Economists” for 100s years

ECONOMIC SURVEY:

144 COUNTRIES



COMMITTED TO
IMPROVING THE STATE
OF THE WORLD

Insight Report

The Global Competitiveness Report

Professor Klaus Schwab
World Economic Forum
Editor

Professor Xavier Sala-i-Martin
Columbia University
Chief Advisor of The Global Benchmarking Network

http://www3.weforum.org/docs/WEF_GlobalCompetitivenessReport13.pdf

WEF: 12 Pillars of Global Competitiveness / Productivity

1. Institutions
2. Infrastructure
3. Macroeconomic Environment
4. Health & **PRIMARY EDUCATION**
5. **HIGHER EDUCATION & TRAINING**
6. Good Market Efficiency
7. Financial Market Efficiency
8. Financial Market Development
9. **TECHNOLOGICAL READINESS**
10. Market Size
11. Business Sophistication / Efficiency
12. **INNOVATION**



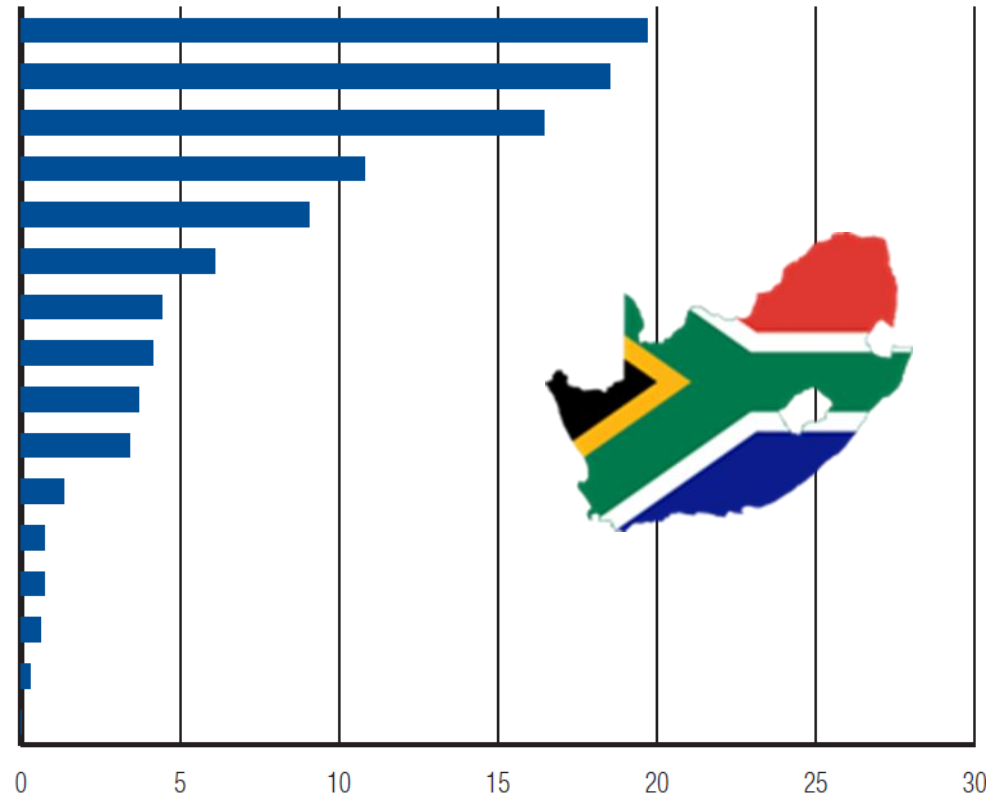
Not Independent – They reinforce each other...

Most Problematic Factors for doing Business

Inadequately Educated Workforce

The most problematic factors for doing business

Inadequately educated workforce.....	19.7
Restrictive labor regulations.....	18.5
Inefficient government bureaucracy	16.4
Inadequate supply of infrastructure.....	10.8
Corruption	9.0
Policy instability	6.1
Access to financing	4.4
Crime and theft	4.1
Poor work ethic in national labor force	3.7
Insufficient capacity to innovate.....	3.4
Foreign currency regulations.....	1.3
Tax rates.....	0.7
Tax regulations	0.7
Inflation.....	0.6
Poor public health	0.3
Government instability/coups	0.0





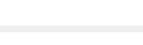






Inadequately educated workforce

% of Peoples Response

4th pillar: Health and primary education

**Rank out
of 138**

123	4.3	
25	35.2	
30	5.1	
137	834.0	
130	3.7	
135	18.9	
130	3.4	
107	33.6	
130	57.2	

4.09 Quality of primary education

126	2.7	
-----	-----	---

4.10 Primary education enrollment rate net %

44	97.1	
----	------	---

5th pillar: Higher education and training

77	4.2	
----	-----	---

5.01 Secondary education enrollment rate gross %

67	93.8	
----	------	---

5.02 Tertiary education enrollment rate gross %

99	19.7	
----	------	---

5.03 Quality of the education system

134	2.3	
-----	-----	---

5.04 Quality of math and science education

138	2.2	
-----	-----	---

5.05 Quality of management schools

21	5.4	
----	-----	---

5.06 Internet access in schools

111	3.5	
-----	-----	---

5.07 Local availability of specialized training services

33	5.0	
----	-----	---

5.08 Extent of staff training

19	5.0	
----	-----	---



What **“DRIVES”** the Global
Economy??

**QUALITY EDUCATION
AT ALL LEVELS**

**TEAM EFFORT:
ALL STAKEHOLDERS WORKING
TOGETHER....**



"The future is here
- it's just not
evenly distributed"

William Gibson

Rondebosch Boys' High School



Many South African Schools



URBAN

Electricity

Water

Toilets

Science lab

Computers

Class 25 - 35

Teacher:
Degree



TOWNSHIP

Electricity (?)

Water

Toilets

Science eqpt

Computers (?)

Class 35 – 45

Teacher:
Diploma



RURAL

NO Electricity

NO Water

Toilets (?)

NO Eqpt.

NO Computers

Class 45 - 70

Teacher:
Diploma (?)



URBAN

Confident

Cocky

Naughty

Questioning

High expectations

Broad general knowledge

English speaking

Technologically literate

Excited by interactives

Favour individual learning

Have computers at home

T O W N S H I P

RURAL

Lacking confidence

Reserved

Well behaved

Accepting

Low expectations

Poor general knowledge

isiZulu speaking

No access to technology

(Initially) Afraid of interactives

Favour group learning

Never used a computer

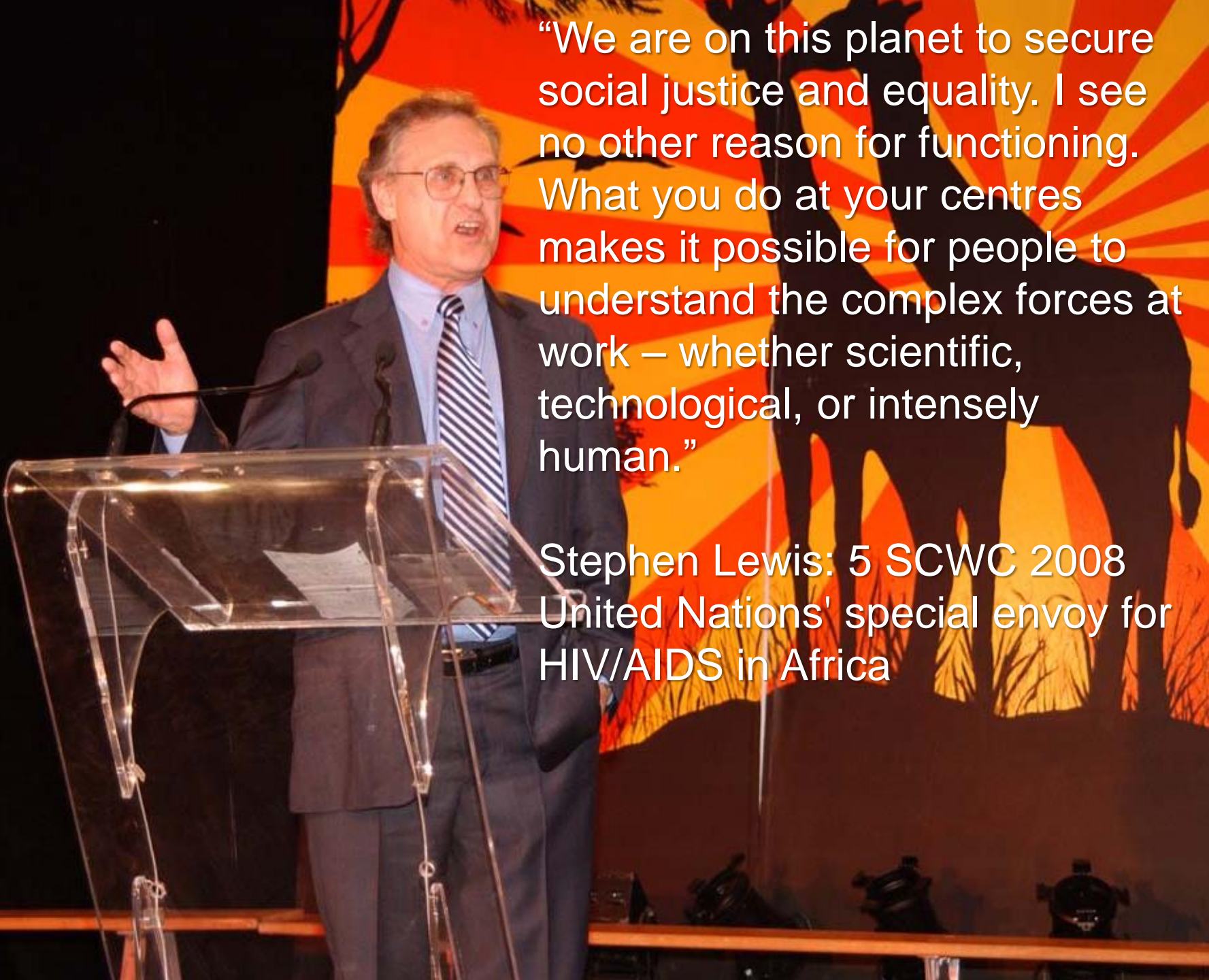


Frank Oppenheimer: Exploratorium



If people feel they understand the world around them, . . . then and only then are they also able to feel that they can make a difference through their decisions and activities.

Without this connection people usually live with the sense of being eternally pushed around by alien events and forces.

A photograph of Stephen Lewis, a man with glasses and a mustache, wearing a dark suit, light blue shirt, and a striped tie. He is standing behind a clear acrylic podium, gesturing with his right hand. The background features a large, stylized graphic with a sunburst pattern in orange and yellow, and a silhouette of a person. The text is overlaid on the right side of the image.

“We are on this planet to secure social justice and equality. I see no other reason for functioning. What you do at your centres makes it possible for people to understand the complex forces at work – whether scientific, technological, or intensely human.”

Stephen Lewis: 5 SCWC 2008
United Nations' special envoy for
HIV/AIDS in Africa